



Economic impact of COVID-19 pandemic on dairy farmers of Karnataka

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ABSTRACT

The novel corona virus (COVID-19) which was first identified on November 17, 2019 in Wuhan city of China turned out to be a pandemic. As a preventive measure against the pandemic, the Government of India announced nationwide lockdown on 24 March, 2020 which continued till 31 May, 2020. This not only limited the movement of people across the country but also led to the implementation of the policies like quarantines, containment zones, social distancing, travel restrictions etc. These policies have affected every sector of the Indian economy including the dairy sector. Against this backdrop, the present study was undertaken to assess the economic impact of COVID-19 pandemic on dairy farmers. The study covered pre-lockdown, lockdown and post-lockdown phases up to December 2020. The data was collected from 200 dairy farmers across Bengaluru Rural and Chikkaballapura districts of Karnataka state. A large majority of the farmers from Bengaluru Rural (81%) and Chikkaballapura (87%) districts reported loss in their income from dairying during lockdown and post-lockdown periods. In both the districts the crossbred cattle were dominant (90%). In Bengaluru Rural district, the net return per litre of milk of crossbred was reduced to the extent of 33.06% during lockdown and by 48.64% during post-lockdown as compared to pre-lockdown period. In Chikkaballapura district, the net return per litre of milk of crossbred was reduced to the extent of 20.90% during lockdown and by 22.77% during post-lockdown as compared to pre-lockdown period. The loss in net return was attributed to reduction in procurement prices of milk, increased feed cost and decline in milk yield in that order respectively.

Keywords: Constraints, Consumption, Income, Lockdown, Milk, Net returns, Procurement price, Unlock phase

Livestock sector is an important sub-sector of agriculture in the Indian economy. As per the estimates of National Accounts Statistics (MoSPI 2019), the contribution of livestock in total agriculture and allied sector GVA (at constant prices) is 28.63% in 2018–19. India continues to be the largest producer of milk in the world accounting for around 20% of world's milk production. Milk production in India during the period 1950–51 to 2019–20, has increased from 17 million tonnes to 198.4 million tonnes as compared to 187.7 million tonnes during 2019–20 recording a growth of 5.70% (NDDB 2019). According to the 20th livestock census (DAHD&F 2019 a), the total bovine population in India is 302.79 million, out of which the total number of cattle in the country is 192.49 million and the total buffalo population in the country is 109.85 million. India stands second in terms of cattle population and first in buffalo population in the world.

The coronavirus disease that surfaced in the year 2019 is a challenge to mankind globally where advancement in

the technological and economic spheres have been sharp and unparallel to the past. The first infection was reported in Wuhan city, People's Republic of China on November 17, 2019 and in no time spread across the world like wildfire. The World Health Organisation (WHO) declared the novel coronavirus as pandemic and pronounced as 'COVID-19'. In order to contain the virus, many countries declared a lockdown of all the social and economic activities. India too observed nationwide lockdown from March 24, 2020 to May 3, 2020 followed by conditional unlocking of social and economic activities in a phased manner from April 20, 2020 and with strict lockdown in the containment zones. Due to lockdown restrictions businesses, all modes of transport and movement of individuals were severely affected. Dairy sector deals with a highly perishable products such as milk, ghee, butter, cheese, paneer and curd. Among these products milk was severely affected due to disruption in demand and supply chain caused by restricted business hours, shutdown of bulk consumers such as hotels, confectionary industry, marriages, parties, schools and inter-state transport.

Among the stakeholders of the dairy sector, dairy farmers were the most affected during the pandemic as predominant proportion of milk produced in India is contributed by

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animals reared by landless, marginal farmers and small farmers. Dairy cooperatives are procuring around 70 to 80% of milk of the organised sector directly from the dairy farmers (Jitendra 2020). The support services of dairy cooperatives like feed distribution, veterinary services, breeding services etc., were crippled during the pandemic. The dairy cooperatives found difficulty in labour availability, transportation, processing and reduced demand for milk and other products. The impact of COVID-19 has not only reduced the income of the dairy farmers but also led to losses to dairy cooperatives. The extent of the impact also varied from individual farmer to farmer. To address the complexity in assessing the impact of COVID-19 pandemic a systematic scientific study is required at primary level. Hence, the present study was an attempt to assess the economic impact of COVID-19 pandemic on dairy farmers.

MATERIALS AND METHODS

Study area and data sources: Karnataka is one among the important agrarian state of India. During the year 2019–20, the share of animal husbandry in Gross State Domestic Product (GSDP) of agriculture and allied activities was 21.81% (DoES 2021). In 2019–20, Karnataka contributed 4.68% to the total milk production of India with production of 9.3 million tonnes. The total cattle population of Karnataka is 8.46 million which accounts for 4.39% of total cattle population in India. Karnataka is having 2.98 million of buffalo population which is 2.71% of total buffalo population in India (DAHD&F 2019 b). Karnataka Milk Federation (KMF) is the apex body for dairy co-operatives in Karnataka. KMF was constructed on the model of Anand Milk Union Limited (AMUL) in 1975. KMF is at present the second largest amongst the dairy co-operatives in India. It stands first in terms of milk procurement as well as sales in southern India. KMF being the apex body in the three-tier structure has 14 Milk Unions under it covering all the 31 districts of the state.

The present study was conducted in Bengaluru Rural and Chikkaballapura districts of Karnataka. From each district two taluks were selected and from each taluk 50 farmers were selected randomly. Thus, the total sample size was 200 dairy farmers. The required data for the study was collected from dairy farmers through personal and telephonic interview using a semi-standard interview schedule. The data collected from the farmers covered the period of pre-lockdown, lockdown and post-lockdown. The time period from 1st January, 2020 to 23rd March, 2020 was considered as pre-lockdown period. Lockdown period comprised of time period from 24th March, 2020 to 31st May, 2020. The time period from 1st June, 2020 to 31st December, 2020 was considered as post-lockdown period. The secondary data on milk prices and feed prices were collected from district Milk Unions.

Statistical analysis: Quantity gap analysis was done for average milk yield per animal per day, quantity of milk sold and household consumption by dairy farmers. Price gap analysis was done for procurement price of milk. Both

the analysis was done with respect to two periods pre-lockdown period vs lockdown period and pre-lockdown period vs post-lockdown period.

Quantity gap =

$$\frac{\text{Quantity during period } t - \text{Quantity during period } (t-1)}{\text{Quantity during period } (t-1)} \times 100$$

Price gap =

$$\frac{\text{Price during period } t - \text{Price during period } (t-1)}{\text{Price during period } (t-1)} \times 100$$

Wilcoxon signed rank test, a non-parametric test was used to test the significance of milk yield per animal per day, quantity of milk sold and household consumption by dairy farmers during pre-lockdown period vs lockdown period and pre-lockdown period vs post-lockdown period. The level of statistical significance was fixed at 5% ($P \leq 0.05$).

Estimation of cost and net returns of milk production during pandemic: The cost of milk production and net returns were computed recently by Gururaj (2020) in Karnataka state. His study areas included dairy farmers of Bengaluru Rural district. The total costs involved in the dairying were composed of variable costs and fixed costs.

Variable costs: Variable costs are those costs which do not vary with the level of output and can be altered in the short run. Variable costs include feed costs due to green fodder, dry fodder and concentrate feeds, labour costs and veterinary and miscellaneous expenditure.

Fixed costs: These costs do not vary with the level of output and remain unchanged in the short run. These costs include costs due to depreciation and interest on fixed capital.

Gross cost = Total variable cost + Total fixed cost; Net cost = Gross cost – Value of dung;

Gross returns = Quantity of milk × Procurement price of milk;

Net returns = Gross returns – Net cost.

All the costs were calculated for per animal per day. This also indicates the cost of maintaining an animal per day.

In the present study, an attempt was made to compute cost and net returns by substituting latest data wherever possible. The present study found significant decrease on the procurement price, increase in concentrate feed cost and reduction in average milk yield during lockdown and post-lockdown periods as compared to pre-lockdown period. These changes were effected in the cost and returns done by Gururaj (2020) suitably and revised cost and returns were worked out for pre-lockdown, lockdown and post-lockdown periods and compared. However, these computations were done based on the assumption that other components of cost and returns did not vary significantly over a short period since the time study done by Gururaj (2020).

RESULTS AND DISCUSSION

Socio-economic profile: Though dairying is a women

friendly enterprise, majority of the dairy farmers who had responded in our study were males (91.50%). About 38% of the dairy farmers in both Bengaluru Rural and Chikkaballapura districts aged between 30 to 45 and 45 to 60 years (Table 1). Majority of the farmers (37.50%) studied up to secondary level. Agriculture was the main occupation with around 90% and 78% of the farmers in Bengaluru Rural and Chikkaballapura districts, respectively. More than 85%

Table 1. Socio-economic profile of the dairy farmers (n=200)

Variable	District		Total No. (%)
	Bengaluru rural No. (%)	Chikkaballa- pura No. (%)	
<i>Gender</i>			
Male	91(91.0)	92(92.0)	183(91.5)
Female	9(9.00)	8(8.00)	17(8.5)
<i>Age (in years)</i>			
<30	6(6.00)	1(1.0)	7(3.5)
30–45	38(38.0)	38(38.0)	76(38.0)
45–60	37(37.0)	38(38.0)	76(38.0)
>60	19(19.0)	22(22.0)	41(20.0)
<i>Qualification</i>			
Illiterate	11(11.0)	16(16.0)	27(13.5)
Primary	13(13.0)	13(13.0)	26(13.0)
Higher primary	17(17.0)	19(19.0)	36(18.0)
Secondary	36(36.0)	39(39.0)	75(37.5)
College and above	23(23.0)	13(13.0)	36(18.0)
<i>Occupation</i>			
Farmer	90(90.0)	78(78.0)	168(84.0)
Labourer	5(5.0)	6(6.0)	11(5.5)
Self-employed	3(3.0)	7(7.0)	10(5.0)
Govt-employed	1(1.0)	5(5.0)	6(3.0)
Others	1(1.0)	4(4.0)	5(2.5)
<i>Family type</i>			
Small	45(45.0)	51(51.0)	96(48.0)
Nuclear	41(41.0)	34(34.0)	75(37.5)
Joint	14(14.0)	15(15.0)	29(14.5)
<i>Income (in lakh ₹)</i>			
< 3.5 (Low)	67(67.0)	38(38.0)	105(52.5)
3.5–7.0 (Medium)	25(25.0)	49(49.0)	74(37.0)
>7.0 (High)	8(8.0)	13(13.0)	21(10.5)
<i>Major source of income</i>			
Agriculture	43(43.0)	41(41.0)	84(42.0)
Dairy	45(45.0)	38(38.0)	83(41.5)
Regular salary	6(6.0)	13(13.0)	19(9.5)
Business	3(3.0)	5(5.0)	8(4.0)
Others	3(3.0)	3(3.0)	6(3.0)
<i>Land (in acre)</i>			
Landless	5(5.0)	5(5.0)	10(5.0)
Marginal (<2.5 ha)	48(48.0)	39(39.0)	87(48.5)
Small (2.5–5.0 ha)	38(38.0)	28(28.0)	66(33.0)
Semi-medium (5.0–10 ha)	8(8.0)	28(28.0)	36(18.0)
Medium (10–25 ha)	0(0.0)	0(0.0)	0(0.0)
Large (>25 ha)	1(1.0)	0(0.0)	1(0.5)

of the sample households belonged to small and nuclear family and only 14.50% of households belonged to joint family. Majority of the farmers, i.e. 52.50% of dairy farmers in Bengaluru Rural and Chikkaballapura fall under the income category of below ₹ 3.5 lakh. As majority of the farmers practiced mixed farming, agriculture and dairying were the major sources of income for more than 80% of the dairy farmers. With respect to landholding status, majority of the farmers in both the districts were marginal (48.50%) and small farmers (33%). Further, all the dairy farmers in Bengaluru Rural district and 98% of dairy farmers in Chikkaballapura district were either members or milk pourers in dairy cooperative societies (DCS).

In Bengaluru Rural district, most of the dairy animals reared by dairy farmers were crossbred (87.82%) and the remaining were found to be indigenous cow (9.63%) and buffalo (2.55%) respectively. Similarly, in Chikkaballapura district, 92.29% of dairy animals reared by dairy farmers were found to be crossbred and the percentage composition of indigenous cow and buffalo were 2.92% and 4.79%, respectively.

Milk yield and sale of milk: The milk productivity of indigenous cattle and buffalo (Table 2) did not vary significantly during the lockdown and post-lockdown periods in both the districts ($P>0.05$). The milk yield of crossbred cattle showed a dip in both the districts during lockdown period. The milk yield was reduced by 2.26% in Bengaluru Rural district ($P<0.01$) and by 4.01% in Chikkaballapura district ($P<0.001$) during lockdown as compared to pre-lockdown period. Further, the condition became normal in Chikkaballapura district during post-lockdown as that of pre-lockdown period ($P > 0.05$). But the milk yield of crossbred in Bengaluru Rural district was further decreased to 2.35% during post-lockdown period ($P < 0.01$). Hence there was a significant difference in the milk yield of crossbred even during post-lockdown in Bengaluru Rural ($P<0.001$). The decline in milk yield could be due to limited supply and increased cost of concentrate feed. The decline in milk yield led to significant difference in the quantity of milk sold by farmers to DCS in both the districts during lockdown as compared to pre-lockdown period. The quantity of milk sold by farmers to DCS in both the districts during post-lockdown did not differ significantly as compared to pre-lockdown period ($P > 0.5$). Bhandari and Lal (2020) in their study reported decrease in sale of milk by farmers which reduced their net income.

Procurement prices of milk: The procurement price of milk has a direct influence on income of dairy farmers. The procurement price of milk in Bengaluru Rural district were reduced by 8.62% from ₹ 29 per litre in pre-lockdown to ₹ 26.5 per litre in lockdown (Fig. 1). Further, it was reduced by 13.21% to ₹ 23 per litre during the post-lockdown period. So, farmers in Bengaluru Rural district were badly affected by reduction in the procurement price by around 20% compared to pre-lockdown period. When compared to pre-lockdown period, there was no reduction in procurement price of milk in Chikkaballapura district and remained the

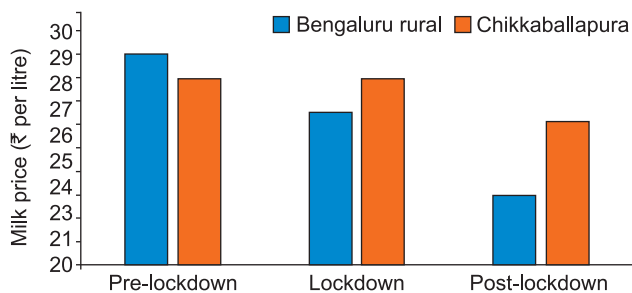


Fig. 1. Procurement price of milk in Bengaluru rural and Chikkaballapura districts during pre-lockdown, lockdown and post-lockdown periods. Note: Pre-lockdown period: 1 January 2020 to 23 March 2020; Lockdown period: 4 March 2020 to 31 May 2020. Post-lockdown period: 1 June, 2020 to 31 December 2020.

same at ₹28 per litre even during lockdown. But during the post-lockdown period, the procurement prices of milk were reduced by 6.61% from ₹28 per litre to ₹26.15 per litre. The dairy farmers in Bengaluru Rural district witnessed more impact with respect to reduction in procurement price as compared to the farmers in Chikkaballapura district. These findings are in conformity with the findings of Bavadam (2020), Begum *et al.* (2020), Chandel *et al.* (2020), NABARD (2020), Popat *et al.* (2020) and Singh *et al.* (2020).

Household milk consumption: Quantity of milk sold depends not only on total milk production but also on the quantity of milk consumed by the household. The quantity of milk consumed by the households ranged from 0.2 litres per day to 2.5 litres per day depending on the family size (Table 2). The quantity of milk consumed by the households increased by 2.10% in Bengaluru Rural district and 10.28% in Chikkaballapura district during the lockdown as

compared to pre-lockdown period. However, the increase seen in Chikkaballapura district during lockdown was alone found to be significant ($P < 0.01$). During post-lockdown, the quantity of milk consumed by households remained same as that of pre-lockdown period in both the districts ($P > 0.05$).

Purchase prices of feed concentrate: One of the major cattle feeds supplied by KMF to their members is Nandini gold (Type -1 feed). Nandini gold is a highly nutritive feed, having higher energy content, fat and total digestible nutrients. It will help the cattle to maintain good health, good reproductive performance and improved milk yield. Nandini Cattle feed is distributed to milk producers through milk unions and dairy cooperative societies (KMF 2020). The type-1 feed price remained unchanged during the lockdown period in both Bengaluru Rural and Chikkaballapura districts (Fig. 2). During the post-

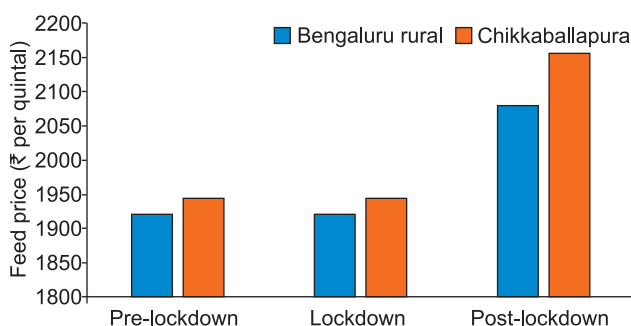


Fig. 2. Prices of concentrate feed in Bengaluru rural and Chikkaballapura districts during pre-lockdown, lockdown and post-lockdown periods. Note: Pre-lockdown period: 1 January 2020 to 23 March 2020; Lockdown period: 4 March 2020 to 31 May 2020. Post-lockdown period: 1 June, 2020 to 31 December 2020.

Table 2. Average milk yield, quantity of milk sold and quantity of household consumption during pre-lockdown, lockdown and post-lockdown periods

Breed	District	Pre-lockdown	Lockdown	Post-lockdown
<i>Average milk yield per animal per day (in litres)</i>				
Indigenous cows	Bengaluru rural	2.63±0.48	2.75±0.50	2.88±0.25
	Chikkaballapura	1.75±0.35	1.75±0.35	1.75±0.35
Crossbred cows	Bengaluru rural	12.36±2.13	12.08±2.07**	12.07±2.51**
	Chikkaballapura	11.47±3.01	11.01±2.87***	11.36±3.28
Buffaloes	Bengaluru rural	2.38±0.63	2.38±0.75	2.50±0.58
	Chikkaballapura	2.40±0.83	2.50±0.87	2.67±0.99
<i>Quantity of milk sold by farmers (in litres/day/household)</i>				
Dairy Cooperative Societies	Bengaluru rural	24.95±13.66	24.28±12.95**	24.68±12.99
	Chikkaballapura	20.81±10.87	19.89±10.20***	20.83±10.77
Private consumers	Bengaluru rural	2.71±1.25	2.71±1.25	2.71±1.25
	Chikkaballapura	3.22±2.86	3.11±2.97	3.33±2.92
<i>Quantity of household consumption of milk by farmers (in litres/day/household)</i>				
Household consumption	Bengaluru rural	0.95±0.48	0.97±0.51	0.95±0.48
	Chikkaballapura	1.07±0.45	1.18±0.61**	1.08±0.49

* $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$. Lockdown and post-lockdown periods were contrasted with pre-lockdown period and statistical significance levels obtained.

lockdown period, an increase of 8.33% was observed in the type-1 feed price from ₹1920 per quintal to ₹2080 per quintal in Bengaluru Rural district. Similarly, in Chikkaballapura district, type-1 feed price was increased by 10.80% from ₹1945 per quintal to ₹2155 per quintal during post-lockdown period.

Family income: The share of dairying in family's annual income ranged from 46.31% in Chikkaballapura to 53.77% in Bengaluru Rural. About 81% and 87% of dairy farmers from Bengaluru Rural and Chikkaballapura districts respectively reported in their income from dairying either during lockdown or post-lockdown period or in both the periods.

Economic loss to the dairy farmers due to COVID-19: Since the majority of farmers crossbred cows income loss to framers due to COVID-19 was done only for crossbred. Economic loss to dairy farmers rearing crossbred in Bengaluru Rural district is presented in Table 3. Due to increase in cost of concentrate feed the total variable cost was increased by 19.82% and 11.35% during lockdown and post-lockdown periods respectively. Due to reduction in procurement prices of milk and milk yield the gross returns was declined by the gross returns was declined by 10.69% and 22.55% during lockdown and post-lockdown periods respectively. As a result of increased feed cost and reduced gross return, the net returns per litre of milk was decreased by 33.06% and 48.64%. Chandel *et al.* (2020) also accounted 41% of economic loss to the milk producers during lockdown period.

In Chikkaballapura district, the total variable cost was

Table 3. Economic loss to the dairy farmers rearing crossbred due to COVID-19 pandemic in Bengaluru rural district

Particulars	Pre-lock down	Lock down	Post-lock down
<i>Variable cost (₹/litre)</i>			
A. Green fodder *	28.25	28.25	28.25
B. Dry fodder *	13.29	13.29	13.29
C. Concentrate feed	78.54	108.15	95.44
D. Feed and fodder cost (D = A+B+C)	120.08	149.69	136.98
E. Labour cost *	25.51	25.51	25.51
F. Veterinary & miscellaneous cost *	4.35	4.35	4.35
Total variable cost (TVC = D+E+F)	149.84	179.55	166.84
Total fixed cost (TFC) *	20.44	20.44	20.44
Total cost (TC = TVC + TFC)	170.38	199.99	187.28
Value of dung in ₹ (G) *	7.94	7.94	7.94
Net cost in ₹ (NC = TC – G)	162.44	192.05	179.34
Milk yield (MY)(litre/ Milch animal)	12.36	12.08	12.07
Milk price (MP)(₹/litre)	29	26.5	23
Gross return in ₹ (GR = MY*MP)	358.44	320.12	277.61
Net return in ₹ (NR = GR – NC)	196	128.07	98.27
Cost of milk production/ litre (NC/MY) (₹/litre)	13.15	15.89	14.86
Net return/litre (NR/MY)(₹/litre)	15.85	10.61	8.14

*Source: Gururaj (2020). Impact of dairy cooperatives among milk producers of Karnataka state: A comparative study. Ph.D. Thesis submitted to National Dairy Research Institute (Deemed University), Bengaluru.

Table 4. Economic loss to the dairy farmers rearing crossbred due to COVID-19 pandemic in Chikkaballapura district

Particular	Pre-lock down	Lock down	Post-lock down
<i>Variable cost (₹/litre)</i>			
A. Green fodder *	28.25	28.25	28.25
B. Dry fodder *	13.29	13.29	13.29
C. Concentrate feed	71.48	98.52	86.17
D. Feed and fodder cost (D = A+B+C)	113.02	140.06	127.71
E. Labour cost *	25.51	25.51	25.51
F. Veterinary and miscellaneous cost *	4.35	4.35	4.35
Total variable cost (TVC = D+E+F)	142.88	169.92	157.57
Total fixed cost (TFC) *	20.44	20.44	20.44
Total cost (TC = TVC + TFC)	163.32	190.36	178.01
Value of dung in ₹ (G) *	7.94	7.94	7.94
Net cost in ₹ (NC = TC – G)	155.38	182.42	170.17
Milk yield (MY) (litre/ Milch animal)	11.47	11.01	11.36
Milk price (MP) (₹/litre)	28	28	26.15
Gross return in ₹ (GR = MY*MP)	321.16	308.28	297.06
Net return in ₹ (NR = GR – NC)	165.78	125.86	126.89
Cost of milk production/ litre (NC/MY) (₹/litre)	13.55	16.57	14.98
Net return/litre (NR/MY) (₹/litre)	14.45	11.43	11.16

*Source: Gururaj (2020). Impact of dairy cooperatives among milk producers of Karnataka state: A comparative study. Ph.D. Thesis submitted to National Dairy Research Institute (Deemed University), Bengaluru.

increased by 18.92% and 10.28% during lockdown and post-lockdown periods respectively due to increase in cost of concentrates (Table 4). Due to reduction in procurement prices of milk and milk yield the gross returns was declined by 4.01% and 7.50% during lockdown and post-lockdown periods respectively. As a result of increased feed cost and reduced gross return, the net returns per litre of milk was decreased by 20.90% and 22.77% respectively during lockdown and post-lockdown periods respectively.

The dairy farmers incurred significant loss in net return both during lockdown and post-lockdown periods of COVID-19 pandemic. The loss in net return was mainly due to reduction in procurement prices of milk, increased concentrate, feed cost and reduction in milk yield in that order respectively. There is an urgent need to increase the procurement prices of milk based on the prevailing input cost especially concentrate feed cost. The policy makers should ensure continuation of incentives and ensure smooth supply of concentrate feed and veterinary services at farmers' door step.

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